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Novel sutureless transplantation for primary pterygium associated with cysts

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Abstract

• **AIM:** To evaluate the efficacy and safety of a novel sutureless AMT (amniotic membrane transplantation) or CAT (conjunctivolimbal autograft transplantation) using fibrin glue for reconstructing corneconjunctival surfaces for primary pterygium associated with cysts.

• **METHODS:** A prospective descriptive study was made of the period 1 January 2006-1 May 2009. Nine patients with primary pterygium associated with cysts underwent pterygium and cyst excision followed by sutureless AMT or CAT using fibrin glue.

• **RESULTS:** During a mean follow-up of 8.00± 0.67 months, all eyes maintained a smooth and stable corneal epithelial surface without recurrent erosion or persistent epithelial defect. The limbal donor site showed the presence of mild depressions without the formation of pseudopterygium. All eyes have good tear secretion function, tear film stability and ocular motility.

• **CONCLUSION:** Sutureless transplantation using fibrin glue is safe and effective for restoring a stable corneconjunctival epithelium in primary pterygium associated with cysts.

• **KEYWORDS:** sutureless; pterygium; cyst; AMT; CAT

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INTRODUCTION

A pterygium is a fleshy, triangular-shaped growth of bulbar conjunctival epithelium and hypertrophied subconjunctival connective tissue in the medial and lateral palpebral fissure encroaching onto the cornea. Pterygium occurs in 0.3%-29%. Surgical intervention is regarded as the first-line treatment and the recurrence rate for surgery are between 24% and 89%. Until now, corneal/conjunctival cysts are not uncommon and may occur spontaneously or following sub-tenon's injection of anesthetic agents^[1], penetrating trauma^[2], cicatricial ocular inflammations^[3], vernal keratoconjunctivitis^[4], strabismus surgery^[5], vitreoretinal surgery^[6,7], scleral tunnel phacoemulsification^[8], Stevens-Johnson syndrome^[9] and sebaceous gland duct^[10]. Suturing is a time consuming task and suture induced irritation and redness are frequent problems. Postoperative wound infection and corneal graft rejection are examples of possible suture related complications. An ideal suture is one which is easy to handle, non-allergenic, affordable and does not promote infection. Fibrin glue is a biological tissue adhesive which imitates the final stages of the coagulation cascade when a solution of human fibrinogen is activated by thrombin (the two components of fibrin glue) and is a blood-derived product that is absorbable, relatively easy to use, and can be kept at room temperature or in a refrigerator. It can be prepared at a blood transfusion center or from patients own blood or obtained as a commercially available preparation. When it is derived from individual volunteer donations, it may have a low concentration of fibrinogen. Fibrin glue forms a smooth seal along the entire length of the wound edge and thereby provides greater postoperative comfort to the patient with fewer complications. Until now,

fibrin glue is being used for lid surgery, conjunctival closure following pterygium and strabismus surgery, lamellar corneal grafting, forniceal reconstruction surgery, amniotic membrane transplantation, closure of corneal perforations and descematoceles management of conjunctival wound leaks after trabeculectomy, adnexal surgery and as a hemostat to minimise bleeding. In this study, nine patients who had rapidly developed a cysts over his pterygium were described. Because of this particular association, the cysts also involved the cornea and caused significant astigmatism. There are three patterns of pterygium with cysts in our study. To the best of our knowledge, there have been no reports about primary pterygium with cysts treatment using sutureless methods. Therefore, we prospectively reviewed our results of amniotic membrane (AM) or conjunctivolimbal autograft (CA) transplantation using fibrin glue in patients with primary pterygium associated with cysts.

MATERIALS AND METHODS

Materials The patients enrolled in the study were consecutively referred for examination at Zhongshan Ophthalmic Center from 1 January 2006 through 1 May 2009. Clinical data were abstracted from the medical records, including diagnosis and pre- and post-operative ocular alignment (Table 1). Nine patients were operated on by one surgeon and consecutively operated with AMT or CAT by fibrin glue. Diagnosis of primary pterygium associated with cysts was made clinically by the presence of corneal pannus, cornea astigmatism, and late slit lamp examination. The invade area included a mean 2.32 ± 0.78 cm (range, 1 to 4 mm) and a mean invade area of $10.6\% \pm 2.8\%$ (range, 5% to 30%) of the entire corneal area.

Methods This was a prospective interventional study, performed with Institutional Review Board approval. The study was also approved by the ethical Committee for Human Research of Nanchang University and Zhongshan University. Informed consent was obtained from all patients. Amniotic membrane tissue was obtained, processed with the basement-membrane side up, and placed on a culture plate and incubated at 37°C in an atmosphere of 5 mL/L CO_2 and 95 mL/L air overnight before they were used. The donor graft at superior limbus was excised with an additional 1.0 mm of length and width relative to the dimensions of the graft bed. By use of minimal manipulation with atraumatic conjunctival forceps and Vannas scissors, the conjunctiva with palisades of Vogt was carefully dissected away from the Tenon's capsule. Before surgery, risks and benefits of surgery and alternative treatments were discussed in detail with the patients and their written consents or assents were obtained. After topical anesthesia and vasoconstriction, the head of the pterygium and cyst was removed as bluntly as

possible to avoid injuring the underlying corneal stroma. Then, superficial keratectomy was performed by blunt dissection of fibrovascular tissue from the underlying corneal stroma without damaging the surrounding healthy limbal tissues and the medial rectus muscle. After applying fibrin glue (mixture of fibrinogen and thrombin, Baxter, Inc, Irvine, CA, USA) on dry denuded wound surface, the AM or AT was flipped on the corneal, limbal or conjunctival edges. After surgery, patients were treated with topical 10 g/L prednisolone acetate four times a day and 3 g/L of loxacin three times a day. The patients were followed for at least six months after surgery. In order to assess the safety of this procedure, each preoperative or postoperative visit included complete ophthalmic evaluation with clinical and photographic documentation of corneal re-epithelialization, stromal vascularization and cloudiness, dissolution of AM or CA, and potential complications. Successful outcome was defined based on the recovery of a stable corneal epithelium, the lack of late fluorescein staining, and a decrease of corneal stromal neovascularization and cloudiness. Recurrence was defined as any growth of fibrovascular tissue into the cornea by slit lamp examination. A slit-lamp examination was performed at every visit to monitor autograft-bed integrity and development of possible complications. The surgical outcome was determined by a masked reader based on the photographic documentation. Moreover, the following tests were performed: tear fluorescein break up time (TFBUT, seconds), Schirmer's I test (mm/5 minutes), healing time and ocular motility.

Statistical Analysis Summary data were reported as mean \pm SD. SPSS 15.0 statistical software was used for data analysis. In this study, $P < 0.05$ has been considered as statistically significant.

RESULTS

There are three patterns location of cyst patients in this study: nasal side, temporal side and both sides. Nine eyes of nine patients underwent superficial keratectomy and cyst excision with AMT or CAT using fibrin glue without complications. During a mean follow-up of 8.00 ± 0.67 months (range, six to nine months), all eyes achieved successful outcomes by regaining a smooth and stable corneal epithelial surface without recurrent erosion or persistent epithelial defect, and by showing less stromal cloudiness and vascularization.

All eyes that received pterygium and cyst excision and ocular reconstruction did not experience any recurrence at the final examination (Table 2). Accompanied by the improvement made on the corneal surface was improved best-corrected visual acuity in all eyes (100 %) (Table 1). Immediately after surgery, AM or CA was completely

Table 1 Characteristics of patients with primary pterygium associated with cysts

No/Sex/Eye/ Age, y	Side	IA (mm)	PC (yr)	CS(mm)	CC (mo)	Visual acuity		Objective refraction	Visual field	SOMR (preoperatively)
						Preoperative	final			
1/M/L/77	TS	4	2	4×3×2	1/2	0.25	0.4	3.50-2.50×180 ⁰	N	Yes
2/F/R/53	NS	1.5	53	3×3×2	12	1.0	1.0	0.50-1.50×180 ⁰	ND	Yes
3/M/R/51	NS	2	20	3×3×2	2	0.8	1.0	1.50-1.20×160 ⁰	N	No
4/M/R/44	TS	3	1	2×3×1	3	0.8	0.8	0.50-0.75×120 ⁰	N	No
5/M/R/76	NS	1	4	2×2×1	1	0.6	0.8	-1.00×105 ⁰	N	No
6/M/L/74	NS	3.5	1	1.5×1.5×1	1	0.6	0.8	2.50-4.50×170 ⁰	N	No
7/M/R/17	NS,TS	3	1	2×1.5×1	6	1.0	1.0	0.50-2.25×175 ⁰	ND	No
8/M/L/58	TS	3	1	3×2×1	1/4	0.8	0.8	N	N	No
9/M/L/9	NS	3.5	2	3×3×1	1	1.0	1.0	N	ND	No

CC: Cyst course; CS: Cyst size; IA: Invade area; ITx, lamellar keratoplasty (performed before the study); N: Normal. ND: Not done; NS: Nasal side; PC: Pterygium course; TS: Temporal side; SOMR: Severe ocular motility restriction

Table 2 Ocular surface condition of patients with primary pterygium associated with cysts

No.	Previous Surgery	Surgery	Complication	Follow-up (mo)	HT (d)	TFBUT		ST I (mm)
						P	FA	
1	Cataract	AMT	Dry eye, astigmatism	10	7	6	10	6
2	No	CAT	Astigmatism	9	6	8	14	11
3	No	CAT	Astigmatism	9	7	9	15	12
4	No	CAT	Astigmatism	8	6	10	16	15
5	No	AMT	Astigmatism	8	7	7	16	10
6	Cataract	AMT	Astigmatism	8	5	8	15	11
7	No	CAT	Astigmatism	8	5	7	13	10
8	No	AMT	No	6	7	9	16	12
9	No	CAT	No	6	7	8	15	11

FA: Final exam; HT: Healing time; P: Preoperative; SOMR: Severe ocular motility restriction; ST I : Schirmer Test I

secured onto the ocular surface in all eyes. After the final follow-up, all eyes have good tear secretion function, tear film stability and ocular motility (Table 2).

DISCUSSION

Our study, for the first time, demonstrated that sutureless AMT or CAT using fibrin glue can be used as the novelty therapy method for pterygium associated with cysts. Most cysts remain small and asymptomatic but occasionally they may reach large proportions and cause significant corneal astigmatism, foreign body sensation, exposure keratitis and visual impairment. In our study, the size of the cysts was corresponding with the size of the head of pterygium. Mechanical friction by pterygium and bulbar conjunctival may play the key effect on the development of the cysts. The epithelium proliferates and gives rise to a cavity with fluid and remains of cell flaking and inflammatory cells. Preventing pterygium and cyst recurrence is the main concern of surgery. The current major methods to prevent recurrence include use of MMC, conjunctival autografting, and amniotic membrane grafting. AM or CA is usually sutured onto the ocular surface using 10-0 nylon sutures to fix [11]. Although the suturing method makes for a secure attachment, it inflicts trauma to the ocular surface.

Moreover, a prolonged operative time and technical skill are needed. Sutures can not only cause postoperative pain and discomfort [11], but also can be associated with suture-related complications [12]. Although corneal contact lens gluing has not been widely used but it has been shown to reduce neutrophil infiltration, which may contribute to tissue damage [13-15]. To avoid suture-related disadvantages and complications, in our study, we devised a sutureless transplantation technique with the appropriate amount of fibrin glue. Our study shows that this AMT or CAT is a safe and useful technique for clinical use, providing a distinct advantage over suture technique. AMT or CAT using fibrin glue can facilitate rapid epithelialization and restored ocular surfaces stability in nine eyes with primary pterygium associated with cysts. During the follow-up, the underlying stroma showed less vascularization and scarring.

In this study, we have found that sutureless transplantation using fibrin glue can inhibit sub-AM or sub-CA fibrosis, and is an effective surgical procedure for treating patients with pterygium associated with cysts after excision surgery. We introduce this new technique and highly recommend it as an alternative therapy in the management of pterygium associated with cysts. In conclusion, sutureless

transplantation using fibrin glue appears to be a safe and effective method of restoring a stable corneconjunctival epithelium for cases with primary pterygium associated with cysts. Further studies are necessary to evaluate the long-term recovery of this surgery method and the effect in a large quantity in patients with pterygium associated with cysts.

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